

First records of *Hipposideros lekaguli* Thonglongya and Hill 1974 from the Philippines

DANILO S. BALETE¹, LAWRENCE R. HEANEY²
and R.I. CROMBIE³

Two specimens of *Hipposideros* from Luzon and Mindoro Islands with complex noseleaf structure are described and compared with *H. lekaguli* from Thailand. The Philippine specimens are nearly indistinguishable from *H. lekaguli* in noseleaf morphology and cranial characteristics and are reported here as the first records of *H. lekaguli* in the Philippines.

KEY WORDS: hipposiderine bat, *Hipposideros*, *Hipposideros lekaguli*, *H. diadema*, *H. pygmaeus*, *H. cervinus*, *H. coronatus*, *H. obscurus*, *H. bicolor*, *H. ater*, *Rousettus amplexicaudatus*, bat morphotype, Mindoro, Luzon, Philippines

INTRODUCTION

In 1974, a new species of hipposiderine bat, *Hipposideros lekaguli*, was described from Thailand (Thonglongya & Hill 1974). Since its discovery, *H. lekaguli* also has been recorded in Peninsular Malaysia (Hill *et al.* 1985). Here we report its occurrence on Luzon and Mindoro Islands, Philippines for the first time. We include selected cranial and external measurements of the two Philippine specimens to illustrate their affinity with the mainland morphotype. A specimen of *H. lekaguli* from Thailand from the Field Museum collection, not previously reported in the literature,

¹Haribon Foundation for the Conservation of Natural Resources Manila, Philippines. Current Address: Department of Zoology, The Field Museum, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605, U.S. A.

²Department of Zoology, The Field Museum, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605, U. S. A.

³Division of Reptiles and Amphibians, National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560, U.S.A.

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was examined and its measurements are presented here for additional comparison (Table 1). Other measurements of *H. lekaguli* from Thailand shown in Table 1 are from the original description (Thonglongya & Hill 1974).

In assigning *H. lekaguli* to the *diadema* group, Thonglongya & Hill (1974) remarked that "...the enlargement of the median ridge and lateral swellings of the intermediate leaf, the development of deep anterior pockets in the lower part of the posterior leaf, and the lobulation of its upper part with the development of posterior supporting septa and consequently of posteriorly directed pockets in fact represent extensions of tendencies already apparent among *diadema* and associated species." The same characteristics were possessed by the two Philippine specimens and supported our decision to place them within the *diadema* group.

The characteristic that easily sets *H. lekaguli* apart from the other members of the *diadema* group (sensu Hill 1963) and among hipposiderines, in general, is its complex nose foliation. In particular, the intermediate noseleaf of *H. lekaguli* is large and tapered at both ends; the median ridge is laterally flattened and distinctly triangular, its base perpendicular to and spanning the width of the intermediate noseleaf. The posterior noseleaf is distinctly trilobed and inflated; three membranous septa, originating from the posterior margin of intermediate noseleaf, separate the posterior noseleaf into three deep pouches that are inflated posteriad. It is further differentiated from other members of the *diadema* group by a skull without frontal depression, with a moderate sagittal crest and a relatively wide interorbital region.

The length of forearm, tail, hindfoot and phalanges of *H. lekaguli* in the Field Museum were taken from specimens preserved in 70% alcohol using a foot rule and recorded to the nearest millimeter. Cranial measurements were taken using a digital caliper and recorded to the nearest tenth of millimeter.

IDENTIFICATION AND DISCUSSION

We examined two specimens of *H. lekaguli* from the Philippines, one each from Luzon and Mindoro islands, and one from Thailand. The two specimens from the Philippines are both male; the one from Thailand is a female. All specimens are preserved in 70% alcohol with skulls removed and are deposited in The Field Museum, Chicago, Illinois.

The Luzon specimen (FMNH 147163) was netted by A. Manamtam/ICBP Team (field number DSB 2035) on April 07, 1992 in Digollorin, Palanan municipality, Isabela Province, ca. 50 m elevation; 16° 50' N, 122° 26' E (Danielsen *et al.* 1994). It was first reported as *Hipposideros* sp. by Danielsen *et al.* (1994), noting that "the general morphology of the noseleaf suggest that it represents a species not previously known from the Philippines". It was collected in primary ultrabasic forest on the eastern side of the Sierra Madre, along the Pacific coast. The vegetation analysis conducted by Christensen & Lund (1993) suggest that this unique forest growing on very poor soil, consisted generally of small trees ranging in height from 8 to 20 m, reaching 15 to 25 m in riverine areas. Canopy height ranged from 50 to 70% of the maximum. Epiphytes, creepers, and *Pandanus* sp. were present. Further notes of plants in the nearby site of Digoyo (16° 55', 122° 27' 30" E) can be found in Co & Tan (1992). The

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Table 1. Selected external and cranial measurements of *Hipposideros lekag.* from the Philippines and Thailand.

Measurement	Thailand ¹	Thailand	Luzon	Mindoro
		FMNH48851	FMNH147163	FMNH142613
Ear	26.5-33.3	-	27	30
Forearm	71.5-79.3	78	66.5	72
Tail	43.7-51.7	-	42	43
Hindfoot	12.1-13.8	14	12	12
Third Metacarpal	53.2-60.5	59	50	54
1st Phalange	22.7-26.1	24	22	23
2nd Phalange	23.7-27.4	-	-	-
Fourth Metacarpal	51.3-59.8	58	49	52
1st Phalange	15.7-17.1	16	16	16
2nd Phalange	11.9-13.8	12	11	12
Fifth Metacarpal	44.0-50.6	50	43	46
1st Phalange	17.4-19.2	17	17	18
2nd Phalange	14.2-16.4	14	13	13
Greatest Length of Skull	25.6-28.0			
Condylbasal Length	22.8-25.2	24.0	21.6	22.9
Condyl canine Length	22.3-24.4			
Width across rostral swellings	7.7- 8.7			
Interorbital Width	3.8- 4.7	4.2	3.9	4.2
Zygomatic Width	13.8-15.0	14.0	12.8	13.2
Mastoid Width	13.1-14.3	13.5	13.1	13.4
C to last M	9.2- 9.9	9.4	7.6	8.2

¹Measurements from Thailand taken from Thonglongya & Hill (1974).

avifauna of the area was described by Christensen & Lund (1993) and its mammal fauna by Danielsen *et al.* (1994). Additional records of bats in the general area on the eastern slope of the Sierra Madre can be found in Mudar & Allen (1986).

The Mindoro specimen (FMNH 142613) was netted on 8 July 1991 by R.I. Crombie (field number 196675). It was obtained at ca. 325 m elevation in Barrio Lantuyan, Baco Municipality, at the base of Mt. Baco, which is part of the Mt. Halcon Range in Oriental Mindoro Province. The specimen was netted in a mostly open agricultural area with scattered large fruit trees, near a small river; the nearest forest was on the slopes of Mt. Baco, about 1 km distant and at least 300 m higher in elevation. Bedrock in the area is basalt with some granite conglomerate, with no evidence of limestone; no caves were nearby, but several were said to be some distance away.

The specimen from Thailand (FMNH 48851) was collected by L.C. Buckley on April 28, 1939. Information on the habitat of the Thailand specimen is not available but Lekagul & McNeely (1977) noted that limestone mountains are an important fea-

ture of the habitat of *H. lekaguli* in Thailand. The presence of *H. lekaguli* in ultrabasic forest in the Sierra Madre and possibly in the adjacent limestone forest, and the presence of *Rousettus amplexicaudatus*, a cave-dwelling rousettine pteropodid, at the same site indicate that *H. lekaguli* might also be dependent on caves in the Philippines.

The Philippine specimens are medium-size bats with large, broad triangular ears. The anterior noseleaf is well-developed, about as wide as the muzzle and the posterior noseleaf, with three supplementary lappets on each side. The internarial septum is swollen and the lateral narial lappets widen prominently on opposite side of the nares. The intermediate noseleaf is thick and fleshy, bluntly tapered at both ends and marked by a prominent triangular median ridge. The posterior noseleaf is very complex and lobulated. It is divided into four deep concavities formed by three short, membranous septa connecting the three posterior, inflated pockets to the upper margins of the intermediate noseleaf and the outer margins of the posterior noseleaf. The skull is elongate, the braincase is inflated, and the anterior frontal swellings of the short, wide rostrum are inflated laterally. The zygomatic arch is expanded and has a prominent and rounded jugal process.

The two specimens from the Philippines (FMNH 142613 & FMNH 147163) matched closely the cranial and noseleaf characteristics of the specimen from Thailand (FMNH 48851) and all three fit well the description and illustrations of the species in Lekagul & McNeely (1977) and Thonglongya & Hill (1974) as discussed above and the external and cranial metrics of the type series presented in Table 1.

Several differences among the three specimens were present. Notable among these differences is the shorter forearm of the Luzon specimen relative to the Mindoro specimen (66.5 and 72 mm, respectively) and the mainland population (71.5-79.3 mm; Table 1). In addition, the skull and toothrow of the Luzon specimen are relatively smaller and shorter compared with the measurements of the Thailand series of *H. lekaguli* (Table 1). Further, most of its external measurements (*e.g.*, hindfoot and phalanges) fall outside the recorded range of *H. lekaguli* from Thailand (Table 1). The Mindoro specimen, on the other hand, fits within the minimum range of its mainland counterpart in most cranial and external metrics (Table 1).

The observed variation in both cranial and external measurements among the specimens from the Philippines and the mainland could be an indication that *H. lekaguli* is a species complex; the Luzon population might be sufficiently differentiated to be recognized as a distinct species in the future. However, the measurements presented here were taken from only two individuals. Additional specimens from Luzon and Mindoro are needed to assess the merits and consistency of these differences.

This new record of *H. lekaguli* brings to eight the number of species of *Hipposideros* found in the Philippines, three of which are endemic, namely: *H. coronatus*, *H. obscurus* and *H. pygmaeus* (Heaney *et al.* 1987). Among the Philippine hipposiderines, only *H. diadema* is larger than *H. lekaguli* (see measurements in Ingle & Heaney 1992 for comparison) and these two together comprise the only members of the *diadema* group in this country. The occurrence of *H. lekaguli* in the Philippines extends the range of this species some 20 degrees east of its previous

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distribution. This new record of *H. lekaguli* for the Philippines increased to five the species of *Hipposideros* it shares with the Malay Peninsula, including *H. ater*, *H. bicolor*, *H. cervinus*, and *H. diadema* (Koopman 1989). Both *H. ater* and *H. diadema* are also shared with Thailand. Prior to this new record, the Philippines was known to share 30 and 20 of at least 67 species of its bat fauna with Malaysia and Thailand, respectively (Koopman 1989). Thus, the presence of *H. lekaguli* in the Philippines is consistent with the known zoogeographic pattern and further strengthens the affinity of its microchiropteran fauna with that present in the mainland of the Indo-Malayan region.

In order to make it possible for investigators to identify this bat in the Philippines in the future, we have modified the key to the *Hipposideros* of the Philippines in Ingle & Heaney (1992) to include *H. lekaguli*, as follows.

Key to Hipposideros of the Philippines (modified from Ingle & Heaney 1992)

1. Posterior noseleaf lobulated, forming deep pockets; median ridge high and triangular; forearm 66.5-72 mm *Hipposideros lekaguli*
- 1'. Posterior noseleaf not lobulated, without pockets; median ridge low and blunt; forearm 77-89 mm *Hipposideros diadema*
- 1". Forearm 37-50 mm 2
2. Two pairs of supplementary leaflets lateral to anterior noseleaf 3
- 2'. No supplementary leaflets lateral to anterior nose 4
3. Inner pair of lateral leaflets meet under anterior noseleaf but outer pair do not; forearm 37-40 mm *Hipposideros pygmaeus*
- 3'. Both pairs of lateral leaflets do not meet under anterior noseleaf; forearm 44-50 mm *Hipposideros cervinus*
4. No vertical septa in posterior noseleaf; tail >30 mm; forearm about 47 mm *Hipposideros coronatus**
- 4". Vertical septa may or may not be present in posterior noseleaf, if they are absent, then tail 18-24 mm; forearm 38-48 mm 5
5. Anterior noseleaf 5.5-7.0 mm wide, intermediate noseleaf 5.0-6.0 mm wide, posterior noseleaf 6.0-8.0 mm wide; hindfoot length 7-10 mm; forearm 38-43 mm *Hipposideros obscurus*
- 5'. Anterior noseleaf 4.0-5.0 mm wide, intermediate noseleaf 3.5-4.0 mm wide, posterior noseleaf 4.5-5.5 mm wide; hind foot length 7-10 mm; forearm 38-48 mm 6
6. Internarial septum not swollen at base; forearm about 42 mm *Hipposideros bicolor*
- 6'. Internarial septum swollen at base; forearm 38-48 mm. *Hipposideros ater*

**H. coronatus* has not been recorded since its description in 1871, measurements given here were based on the original description (Peters 1871) and comments of Taylor (1934).

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